

**SIXTH FRAMEWORK PROGRAMME  
PRIORITY IST-2002-2.3.1.8  
Networked Audiovisual Systems**



**Uni-Verse project  
Deliverable D 1.2 Rev A  
Project Presentation  
June 15, 2005**



STREP project

Project acronym: Uni-Verse

Project full title: A Distributed Interactive Audio-Visual Virtual Reality System

Proposal/Contract no.: 002228

Distribution: Public

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<b>WORKPACKAGE DESCRIPTION</b>		
Workpackage Title: <b>Management</b>		WP No: <b>1</b>
Starting date: month <b>1</b> Duration: <b>36</b> months		Total Effort in Man-months: <b>14</b>
Member involved	Task description / Contribution of Member	Effort man-months
<b>KTH</b>	<b>WP Leader, coordinator</b>	<b>11</b>
<b>II</b>	Participant	<b>3</b>
<b>HUT</b>	Participant	<b>0</b>
<b>FHG/IGD</b>	Participant	<b>0</b>
<b>MINUSPLUS</b>	Participant	<b>0</b>
<b>PAREGOS</b>	Participant	<b>0</b>
<b>BLENDER</b>	Participant	<b>0</b>

### **Objectives**

The objective is the management of the project in order to guarantee the efficient functioning, to manage problems that may arise and to ensure the timely completion of deliverables and milestones.

### **Description of work / tasks**

#### **WP 1.1. Coordination of activities**

The over-all management of the project will be assured by the project coordinator. The coordinator will be assisted by a project coordination committee, which will consist of one representative from each partner. The main tasks will be the coordination of activities in the project, and the dissemination of information to consortium partners. The coordinator will also ensure the timely completion of deliverables.

#### **WP 1.2. Project coordination meetings**

Meetings of the project coordination committee will be convened at regular intervals in order to monitor progress. If difficulties arise ad hoc meetings will be convened with the parties concerned.

#### **WP 1.3. Web page**

#### **WP 1.4 Update of web-page**

A web page will be established and maintained for the purpose of disseminating information within the consortium and to potential users.

### **Deliverables**

**D1.1** Web page (Month 3)

**D1.2** Project presentation

### **Milestones and criteria**

**M1.1** Web page; Web-page published (Month 3)

### **Interrelation with other workpackages**

All workpackages

## **Deliverable D1.2 Project Presentation**

### ***Summary***

This document, D1.2 Uni-Verse Project Presentation contains two parts.

1. The formal project description required by the EC
2. A set of slides used at presentation about the project.

**Project description**

Project acronym :	Uni-Verse
Project name :	A Distributed Interactive Audio-Visual Virtual Reality System
Logo	
Project URL :	<a href="http://www.uni-verse.org">http://www.uni-verse.org</a>
Project reference :	IST-2003-02228
Contract type :	STREP
Start date :	1/02/2004
End date :	31/1/2006
Project duration	36 months
Total budget :	2,972,548 € (including own contribution)
Action lines :	Audiovisual systems
Clusters :	
Project Co-ordinator :	Mr. Gert Svensson Kungliga Tekniska Högskolan PDC SE-100 44 Stockholm Sweden Tel: +46 8 790 78 84 Fax: +46 8 24 77 84 Email: <a href="mailto:gert@pdc.kth.se">gert@pdc.kth.se</a>
Number of partners :	7
Main objectives :	<p>The goal is to create an open source Internet platform for multi-user, interactive, distributed, high-quality 3D graphics and audio for home, public and personal use. The platform will support high-quality 3D-graphics as well as high-quality 3D-audio and acoustic simulation.</p> <p>The foundation of the platform is a lightweight, low latency, general-purpose network protocol for 3D data, which lets multiple applications act together as one large system by sharing data over the network. If one application makes a change to the data the change is distributed instantly to all interested clients. Therefore rendering engines, tools, simulation engines and other components can be separate applications working together over a network to form an application. The platform will be scalable from simple PDA's to large immersive environments.</p> <p>The core of the project is to integrate state-of-the-art technology from different partners using this protocol. This will form a consistent and useable system with unique dynamic properties</p> <p>The components we intend to develop include an advanced 3D graphics engine, a unique 3D audio acoustics simulator, tools and visual scripting and computing engine as well as integrating new and existing tools. We also intend to build and research new opportunities given this highly dynamic collaborative system such as dynamic mesh generation, adaptive global illumination solutions, distributed computing.</p> <p>Our research will be focused on integration as well as development in the respective fields. We will also research the scalability of the system for future wide spread use.</p> <p>The platform will be tested in two application areas, architecture and digital media</p>

Technical approach	
<p data-bbox="212 300 293 327">Server</p>  <p data-bbox="89 624 394 680">Tools, rendering engines, services and other clients</p>	<p data-bbox="539 264 1430 734">The foundation of the platform is an IP network protocol for integrated dynamic 3D-graphics and 3D-audio content. This lightweight, low latency network protocol will be based on an existing protocol known as Verse developed by one of the partners. This protocol lets multiple components act together as one large application by sharing data over a network. If one application makes a change to the data the change is distributed instantly to all interested clients. This simple network protocol allows anyone to write components and applications that are compatible. The protocol is usually configured with a central server that acts as a hub passing of messages to the clients. Clients no longer need to access data through load/save features since all communication is done instantly using the protocol. This also adds redundancy since all clients and the server have a copy of the data. No data is lost if one component crashes. The data format used by the protocol is an easy-to-use, non-application specific format, but with advanced features such as subdivision surfaces geometry, shader trees, high dynamic range and 3D textures.</p> <p data-bbox="60 770 1417 943">Graphics will be provided by a rendering client, which already exists in prototype form, featuring subdivision surfaces, texture compositing, programmable shades, displacement mapping, dynamic lighting and shadows. The current early version will be extended to make use of the new hardware capabilities in OpenGL 2.0. This rendering engine will be written to be portable between multiple operating systems and run on standard PCs and high-end workstations and Caves. In order to facilitate mobile phones, PDAs and other hand-held devices with limited hardware resources we will also develop a low-end rendering client.</p> <p data-bbox="60 978 1422 1182">The goal of the audio client is to provide real-time acoustic simulation and rendering. The idea is to enable concurrent architectural and acoustical design in a distributed manner. The client will combine physical and perceptual modelling in a novel way to achieve a high performance level. The main research questions in this area are: 1) automatic geometry simplification of complex architectural models to make them suitable for acoustic simulation, 2) audio culling, i.e. finding the most relevant sound sources contributing to the overall soundscape in a virtual acoustic environment, 3) relation of perceptual and physical acoustic parameters for efficient acoustic rendering.</p> <p data-bbox="60 1218 1433 1480">A special script client with a run-time environment built in will be developed in the project. This client connects plug-in modules in dataflow fashion. This can be used to create data relations, events, animations and other interactivity. In this environment you can for instance relate a door's angle to a button, a train to a specific path or an avatar's animation to a specific user action. By creating flow graphs with components, a non-programming user can easily create advanced behaviour and logic. This environment will have a simple API so that anyone can write additional plug-ins. For this scripting environment we will develop a number of plug-ins, for mathematics, logic, event handling, graphics processing and animation. Some of them will be basic but there will also be some more advanced plug-in such as the radiosity plug-in described below. We will also create modules for dynamic mesh systems like L-systems for dynamic generation of biological entities like trees, vegetation and dynamically generated animals.</p> <p data-bbox="60 1516 1430 1720">The simulation of light is very important for the visual appearance in virtual environments. This system will include a progressive radiosity module, which gives a high degree of realism. The radiosity module will provide a physical based distribution of light radiation in a 3D scene. This is done by considering the 'interaction' of light between surfaces of objects and light sources in the 3D scene. Using this method will create realistic lighting and will also create correct soft shadows of the objects, which will look far more realistic than the hard-edged shadows produced by other rendering systems. Especially in closed environments, like interiors of buildings, this method will create very realistic images.</p> <p data-bbox="60 1756 1433 1899">A number of tools will be developed to be able to edit and create the data in real-time. Since all tools are connected by the protocol there is no need to create one large application in order to get integration. Therefore the tools will be divided in multiple smaller components. This approach is more flexible since the user can choose the tools they want to use for different tasks. Tools can also be made cleaner and with more focused design and interface with a smaller scope inviting to more innovative and experimental solutions.</p> <p data-bbox="60 1935 1390 2018">Additionally to the tools we will create a plug-in for a selected graphics application. This will allow the selected application to connect to the network and share data. This would for instance enable multiple users to be able to draw, edit and interact with the same data and in real time see the other users' actions in a familiar interface.</p>

Key issues	
<p>The acoustic simulation is a most demanding research task. Real-time acoustic simulation is highly demanding and to that in the fully dynamic Verse environment is even more demanding. This means that the geometry reduction module must be highly intelligent.</p>	
<p>The script client is really the basis for a full-blown 3d system. The intention is to develop the basis in the project and let the open source community further develop the tool.</p>	
Expected impact	
<p>The goal is to create a platform that can unify the technology found in virtual reality, games, and networking to form a delivery platform for a new form of content. Media has benefited enormously by content delivery standards such as 35mm film, PAL/NTSC, FM radio, and HTML. Today we see a game market with huge potential held back by the lack of content standard and closed hardware platforms. If this technology could be made standardized we would be able to create development pipelines, tools and education that would increase overall quality and experience, drastically reduce the development cost of content and open up for a wide range of applications. With most households having computers and with the advent of cheap 3D hardware and broadband Internet connections we believe that the time has come. This platform must be open to allow any content provider to create content, any hardware vendor to create new hardware and any tool/technology vendor to add software.</p>	

***Uni-Verse slides***

# Uni-Verse

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Coordinator

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# STREP project Uni-Verse

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- ◆ Open Source Distributed system for graphics, sound and acoustics
- ◆ Based on
  - Verse protocol (developed at Interactive Inst)
  - Sound system from Helsinki University of Technology, Interactive Institute
  - Data reduction from Fraunhofer Inst./IGD
- ◆ Budget
  - Total budget 3.8 million Euro in 36 months

# Partners



- ◆ KTH Coordinator
- ◆ Interactive Institute (Stockholm, Umeå, Visby)
- ◆ Helsinki Technical University
- ◆ Fraunhofer Inst. IGD
- ◆ Blender foundation
- ◆ Paregos Media Design
- ◆ MinusPlus Architects



# 3D sound simulation

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- ◆ Games

- Experience based

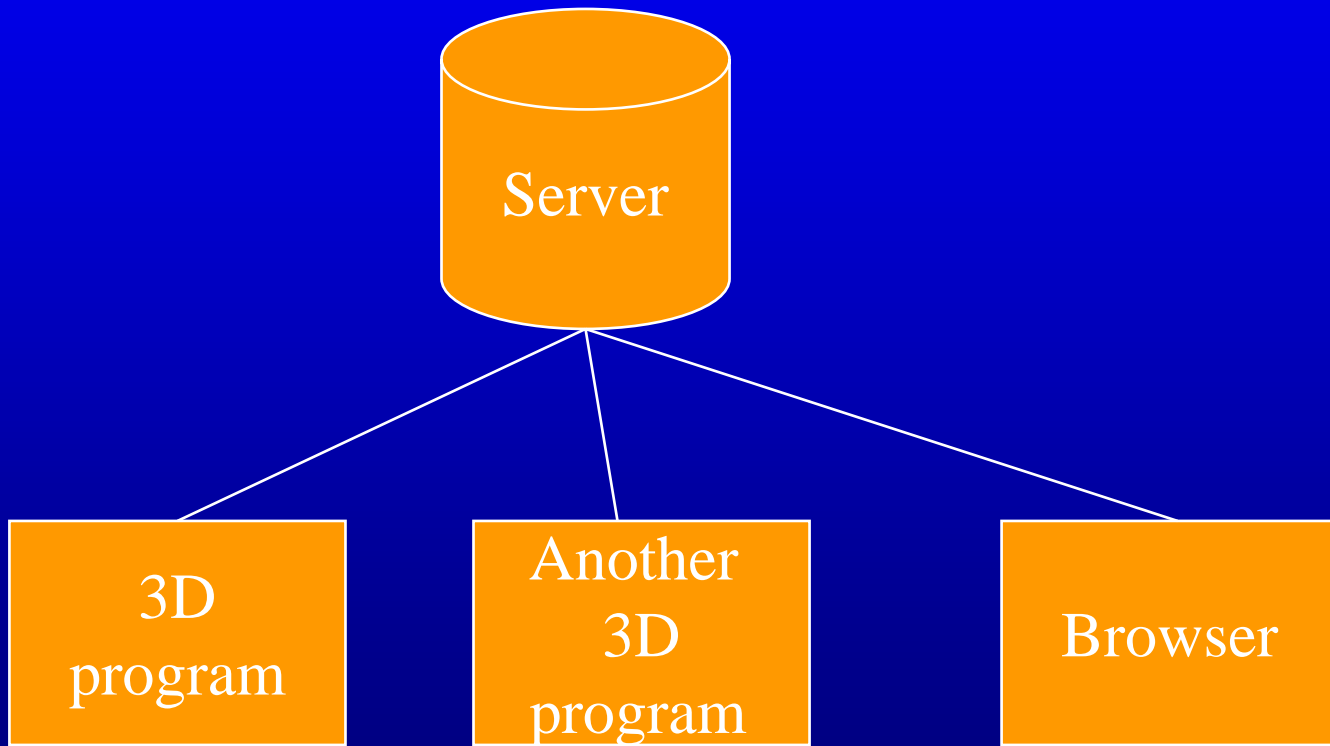
- ◆ Architect offices, sound engineer

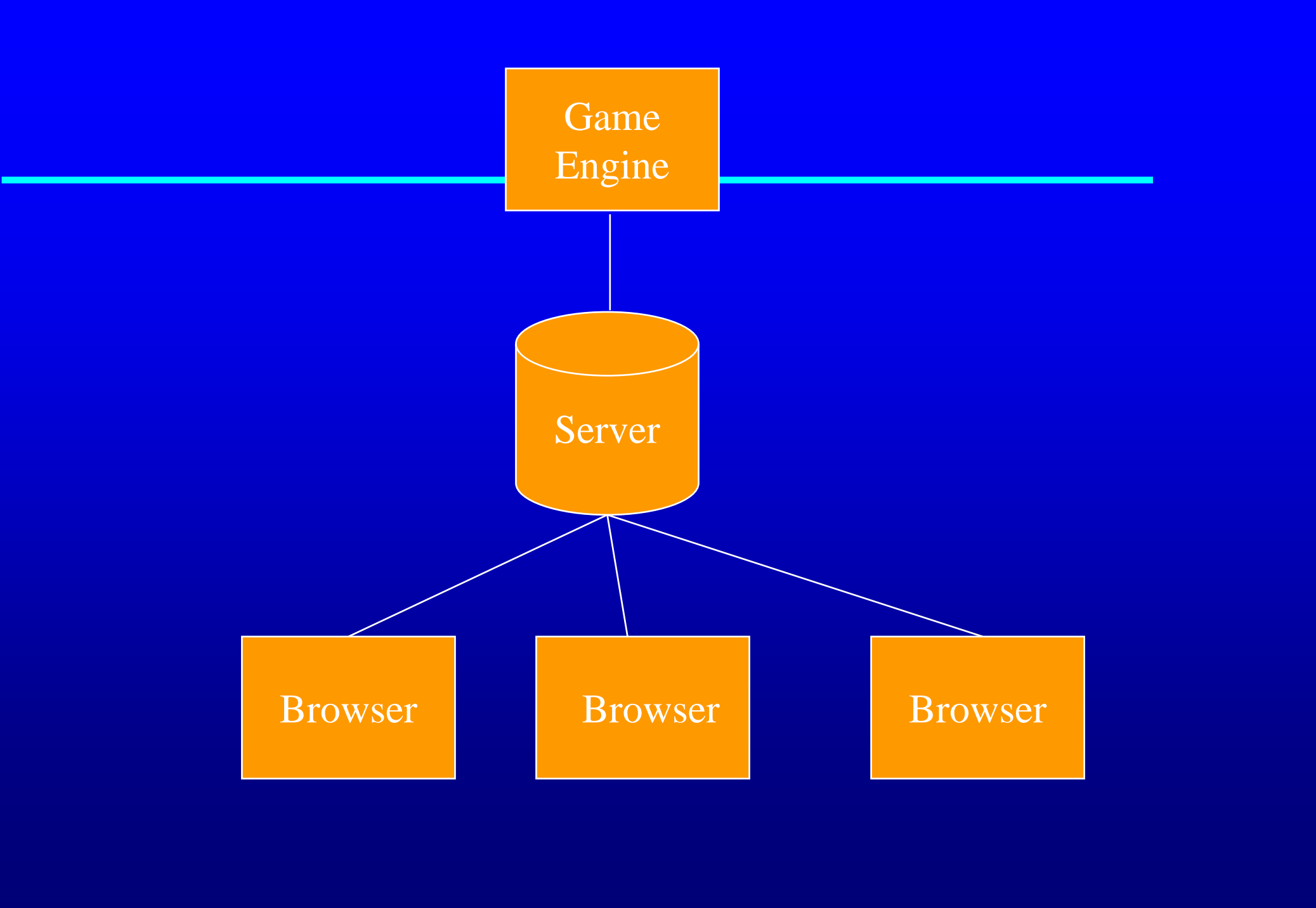
- Physical correct simulation

# What is Verse?

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- ◆ Real-time, low-latency, low granularity protocol for 3D information
- ◆ Replacing file transfers with real-time communication
- ◆ Possible to connect several 3D modules to form one application





Super-  
computer

Server

Browser

Browser

Browser

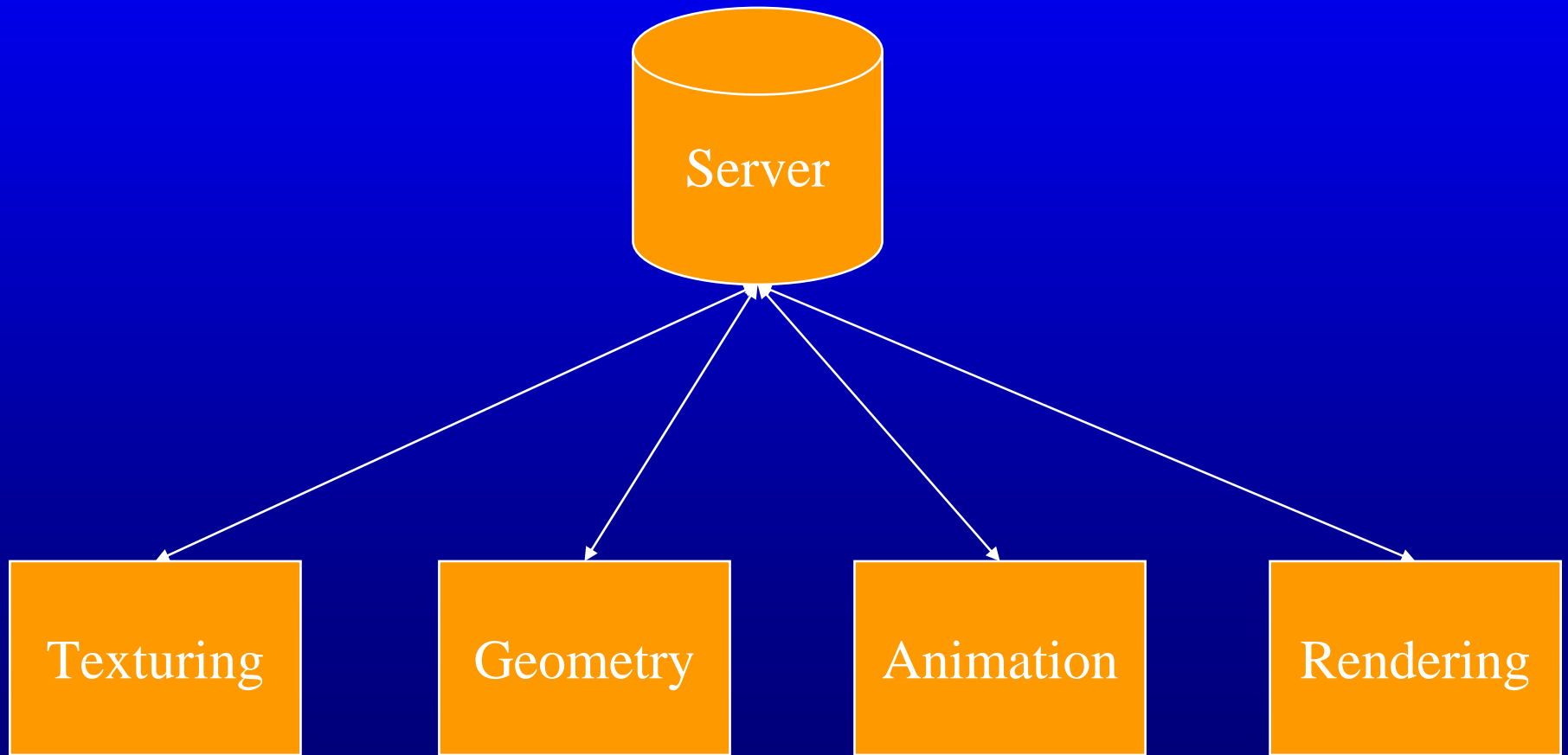
# Typical 3D-application

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Texturing	Animation
Geometry	Rendering

# With Verse

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# What will we do?

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- ◆ Sound and acoustic simulation
- ◆ Light simulation
  - Progressive radiosity module
- ◆ Browsers for different platforms
  - PC Open GL, Open GL2
  - PDA Open GL ES
  - Caves and large system OpenSG
- ◆ Plug-in commercial 3d-tool (Maya or Max)

# What will we do ...

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## ◆ Tools

- Debugging: Connector
- Modelling: Loq Airou
- UV editor
- Chat
- Loader/Saver etc

## ◆ Scripting tool

- Framework for a complete 3D system
- Connect modules ala AVS, Open DX

## ◆ L-systems, evolving systems module

## ◆ Data reduction module

# Demonstrators

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- ◆ Games, digital media
- ◆ Architects office

# When to use Uni-Verse?

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- ◆ Tightly coupled graphics modules
- ◆ Distributed system where several clients makes changes to the world
- ◆ Advanced 3d-sound